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Polyakov loop, random matrix, and color confinement

Thursday 22 August 2024 14:00 (30 minutes)

We clarify the meaning of the Polyakov loop by examining the partition function in the path integral formulation and the Hamiltonian formulation. It turns out that the Polyakov loop can characterize confinement and deconfinement without relying on the center symmetry, and hence, even for QCD. We discuss two applications: (1) Two-point correlator of Polyakov loops in the confined phase reduces to a random walk on the group manifold, from which linear confinement potential with Casimir scaling follows almost immediately. (2) At large N, confinement/deconfinement transition consists of two phase transitions. One of them corresponds to the center symmetry breaking when the theory has center symmetry. The other corresponds to the chiral symmetry breaking and instanton condensation. These transitions may survive at finite N.

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